Chapter 4: Problems 1, 11, 12, 30, 31, 46
Chapter 5: Problems 35, 39

Chapter 4 Problems

1. Measuring an arc on the picture it looks like a star about 5.3 cm from the center travels about 3.3 cm.

The circumference corresponding to 5.3 cm is $2\pi \cdot 5.3\,\text{cm} \approx 33\,\text{cm}$

$\frac{3.3\,\text{cm}}{33\,\text{cm}} = \frac{1}{10}$ of a circle, so the exposure was $24\,\text{hrs}/10 = 2.4$ hours.

(If you want to be overly fussy $\frac{23\,\text{hrs}\ 56\,\text{minutes}}{10}$)

The stars on the right side of the picture are going up.

11. (a) 16th mag is 5 mags dimmer than 11th mag. The 11th mag star is 100x brighter.

APPARENT MAGNITUDE

(b) The 6th magnitude star is 10 mags brighter than the 16th magnitude star. It is

$100 \times 100 = 10{,}000$ times brighter

it might just be closer — apparently!

12. $\frac{1}{24}$ of $360°$ is $15°$.

If you want to be fussy, the stars go around once every 23h 56m. So a more accurate answer is

$$\frac{1\,hr}{23\,hr\ 56\,m}\,360° = \frac{1}{23\frac{56}{60}}\,360° = 15.04°$$

30. The stars advance the same amount from one month to the next ($\frac{1}{12}360° = 30°$) as they do in two hours. So the answer is True. (2 months corresponds to four hours).

31. False, because at latitude 38°. we can never see south of declination $-52°$ $(38+52=90)$. So no matter when you look from SF you will never see (for example) Proxima Centauri or The Magellanic Clouds.

46. 7 mags is 5 mags + 2 mags
$= 100 \times 2.5 \times 2.5 \approx 600$

The exact way is to put $100^{-(m_2-m_1)/5}$ into a calculator $m_2=3$ $m_1=10$ $100^{-(3-10)/5} = 631$

Chapter 5 Problems

35. If you use yrs and A.U. as your units, then the proportionality constant in $P^2 \propto a^3$ is $P^2 = \frac{(1\,yr)^2}{(1\,A.U.)^3}\, a^3$

A comet with 10^6 yrs as its period has

$$P^2 = 10^{12}\ yr^2$$

So a^3 must be $10^{12}\ A.U.^3$

$$a = \sqrt[3]{10^{12}}\ A.U. = 10^4\ A.U.$$ (That's choice (c).)

39. P^2 for Xander is $64\ yr^2$

So a^3 must be $64\ A.U.^3$

$$a = \sqrt[3]{64}\ A.U. = 4\ A.U.$$ (That is choice (a).)